Experience of Harvard Step Test using for exercise tolerance assessment in children with single ventricle

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Aim: To present the assessment of exercise tolerance (ET) in children with single ventricle (SV) after total cavopulmonary shunt using modified Harvard Step Test (MHST).

Study methods: MHST was performed to 37 patients at the age from 6 to 10 years old (average age 6 ± 0,4). The testee was proposed to climb a step during three minutes. Taking into account the patient’s age it was considered to standardize the height of the step till 20 cm for all the groups. After the test was stopped the heart rate was assessed at the second, third and fourth minute during 30 seconds. MHST index is rated by formula: \( t \times 100/(f_1+f_2+f_3) \times 2 \), where \( t \) - climbing duration in seconds, \( f_1, f_2, f_3 \) – heart rate at the second, third and fourth minute during 30 seconds of restoration, correspondingly. Condensed formula can be used in screening programs: MHST = \( t \times 100/f \times 5,5 \), where \( t \) - climbing duration in seconds, \( f \) – heart rate taking into account the time of test carried out by the patients with heart failure (HF) signs.

Results: NYHA II (74%) predominated in most patients with SV. Initial heart rate corresponded to age norms. Heart rate increase was from 5 to 10% in 82% of pts with SV. Adverse response to exercise stress by way of heart rate decrease in 5-10% was marked in the rest of the children. According to study protocol the study was carried out in full in 67% of pts with SV. Test duration was lesser than necessary 3 minutes due to low ET. The reasons for stopping the test were muscle weakness and dyspnea in this group of patients. MHST varied from 24.1 to 75 in examined patients. The maximum test values were marked only in patients with test time 3 minutes.

Conclusion: Modified Harvard Step Test can be performed to preschool children and children of primary school age with SV after total cavopulmonary shunt to assess ET if spiroergometry is not possible.

Key words: single ventricle, exercises tolerance, modified Harvard Step Test.